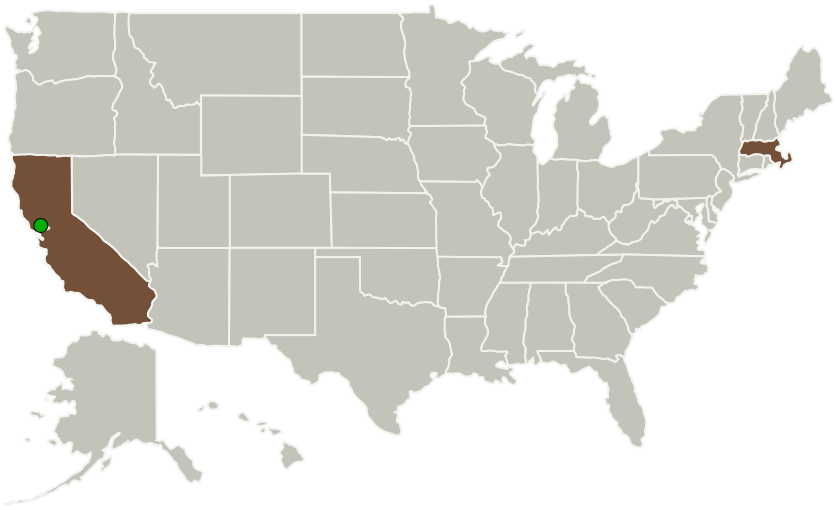
# Ultra Low Noise Compact High Performance IMU, Phase I

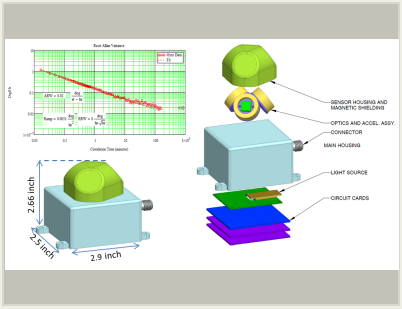
Completed Technology Project (2017 - 2017)

## Project Introduction

We propose a new approach for to the design and fabrication of miniaturized Interferometric Fiber Optical Gyroscope (FOG) that enables the production of smaller IRU and IMU with substantially reduced noise (ARW) and better bias performance. The gyro noise is reduced by a factor of at least 4 to 6 by utilizing an innovative approach for the light source noise reduction. In addition the sensor is using a new fiber combined with innovative coil design that results in lower bias drift and up to tenfold reduction of the bias temperature sensitivity compared to the existing FOG products as well as additional x 2 reduction of the ARW. The combination of these attributes supports a smaller, lower cost, high performance and robust IMUs that can serve future NASA mission needs; a 33 cube inch IMU (LN200 size) is expected to deliver Navigational grade performance, with ARW of 0.001 deg/rt-hr and bias residual over temperature of 0.02 deg/hr, while a larger FOG is expected to enable ARW of 0.0002 deg/rt/hr with 0.005 deg/hr bias and IMU volume < 70 cube inch. We also present innovative concept for a miniaturized tactical IMU based on the above technology (< 1 deg/hr bias over temperature and 0.02 deg/rt-hr ARW) with a volume as small as 5 cube inch.

## Primary U.S. Work Locations and Key Partners






Ultra low noise compact high performance IMU, Phase I Briefing Chart Image

## Table of Contents

**Small Business Innovation Research/Small Business Tech Transfer**

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| Infibertech, Corp. | Lead Organization | Industry | Sharon, Massachusetts |
| Ames Research Center(ARC) | Supporting Organization | NASA Center | Moffett Field, California |

| Primary U.S. Work Locations | |
|---|---|
| California | Massachusetts |

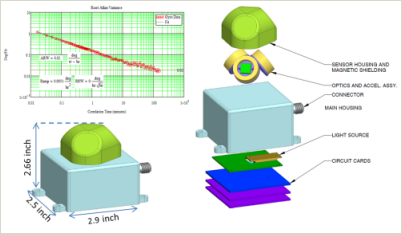
## Project Transitions

**June 2017:** Project Start

**December 2017:** Closed out

**Closeout Summary:** The primary (non-rechargeable) battery completed radiati on testing and reached TRL4, possibly TRL5. This design has been baseline for t he Europa Lander project and further environmental testing will be completed u nder that project. The rechargeable battery reached TRL4.

## Images




**Briefing Chart Image**
Ultra low noise compact high performance IMU, Phase I Briefing Chart Image
*(https://techport.nasa.gov/image/130957)*

## Organizational Responsibility

**Responsible Mission Directorate:**
Space Technology Mission Directorate (STMD)

**Lead Organization:**
Infibertech, Corp.

**Responsible Program:**
Small Business Innovation Research/Small Business Tech Transfer

## Project Management

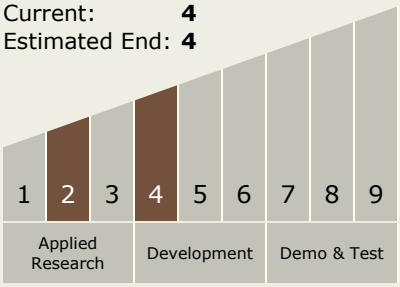
**Program Director:**
Jason L Kessler

**Program Manager:**
Carlos Torrez

**Principal Investigator:**
Ram Yahalom

## Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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## Technology Areas

**Primary:**

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.2 Navigation Technologies
    - TX17.2.3 Navigation Sensors

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System